The commonwealth or the accused may take such oral or written proof for or against the accused as it may deem it the best to present these facts.

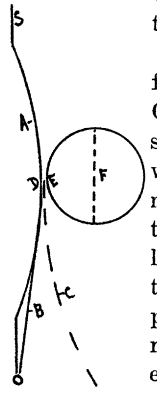
This act to be in full force and effect from and after its passage and approval as provided by law.

ARTHUR M. MILLER
UNIVERSITY OF KENTUCKY,
FEBRUARY 8, 1922

## RELATIVITY AND STAR DIAMETERS

TO THE EDITOR OF SCIENCE: That Michelson's wonderful measurements on star diameters have a fundamental bearing on Einstein's theory and are capable of affording a more decisive proof of it than even the eclipse experiments does not seem to be yet appreciated. In my former note of March 25th, 1921, I expressed the hope that some one more competent than myself would discuss the subject; but nothing has so far appeared but a short note by Dr. Burns, and as he appears to be under some misconception of the theory, I will, with the Editor's permission, go into it a little more in detail.

Dr. Burns refers to an acceleration in the direction of propagation. But this field has nothing to do with the measurement of the diameter. What we do, virtually, is to divide the star disc F into halves by the diameter, shown as a dotted line, and take the centers of gravity of the two semi-circles as two sources. Obviously a considerable amount of the light will come from the edge, as at E, and all of it, except that coming from the diametric line, will be pulled sideways towards the diameter.




By Einstein's theory light from a source S to an observer O will be curved in the manner shown, since all world lines are warped in the neighborhood of matter. Dr. Burns's statement that there is no warping of the light from the star disc means that light originating from a prominence E on the star would not be warped, while light traveling past it, originating from an outside source S would; which necessitates an ether between F and O; which is contrary to the theory of relativity.

The really important point, which I had hoped to bring out in the discussion, is that a purely gravitational bending, shewn by the dotted line C, is not a mere warping, but a permanent change of path to a sort of hyperbola. If the light bending were a purely gravitational effect, all stars should shew measureable diameters, if above certain dimensions. But they do not appear to do so. As the only two alternatives seem to be gravitational bending or Einstein's theory, this seems to be a definite proof of the theory.

But we need a quantitative discussion, at, as I have said, the hands of men better qualified than myself. Mere guess work is not enough. It is true that the angular effect of the world line warping changes with distance, being twice the gravitational effect, but the amount of warping by the sun is approximately 1½ seconds, while the total angle subtended by Betelgeuse is only 1|30 of this, and Betelgeuse is somewhere around ten million times the size of the sun. A quantitative calculation is necessary, not only for Betelgeuse but also for those stars which shew no measurable disc, to explain the absence of a measurable gravitational bending, if Einstein's theory is not true.

REGINALD A. FESSENDEN

## PRELIMINARY NOTE ON THE ETIOLOGY OF POTATO TIP-BURN

DURING the past two years investigations have been carried on at the Experiment Station of Pennsylvania State College to determine the etiology and specificity of the potato tip burn caused by the feeding of the potato leaf hopper, *Empoasca mali* Le B.

These experiments were in the form of a series of inoculations with aqueous and alcoholic extracts of *E. mali* Le B, and other potato feeding insects. The inoculated plants were exposed to sunlight of varied intensity by the use of glass and mesh cages to determine the role of sunlight in the development of the disease.